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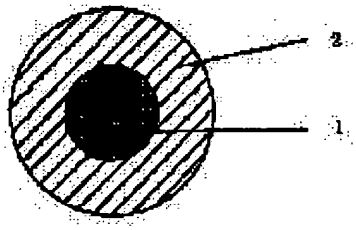
(54) COATING MATERIAL AND ELECTRIC WIRE USING THE SAME

(57)Abstract:
PROBLEM TO BE SOLVED: To obtain both a coating material having various characteristics such as tensile properties, wear resistance, flexibility, flame retardance, freeze resistance, etc., required as properties of a coating material for internal wiring of electronic device and automobile, core wire of optical fiber, optical fiber cord, etc., having no elution of heavy metal compound, emitting neither a large amount of smoke nor a corrosive gas, and to produce electric wire coated with the coating material.
SOLUTION: This coating material is obtained by blending 100 pts.wt. of a resin composition comprising (a) ≥20wt.% of a polypropylene based resin and (b) 40-80wt.% of a styrene-based thermoplastic elastomer composed of a polystyrene as a hard segment and a hydrogenated substance of a (co)polymer of butadiene and/or isoprene with (c) 30-70 pts.wt. of ammonium polyphosphate- based flame-retardant and (d) 80-120 pts.wt. of a metal hydride. The objective electric wire is obtained by coating the outer periphery of a conductive material 1 with a coating layer 2 of the coating material.



no tensile strength fiber coat

LEGAL STATUS

* NOTICES *

DETAILED DESCRIPTION

[Detailed description]
[0001]
[The technical field to which invention belongs] About covering material, such as electronic equipment, an internal wiring and optical fiber core wire of an automobile, and an optical fiber code, still in detail, it has ****, a **** property, abrasion resistance, fire retardancy, thermal resistance, and cold resistance as it is good, and this invention relates to the outstanding covering material which has neither the elution of a heavy metal compound, nor occurrence of a lot of smoke and a corrosive gas at the time of abandonment of reclamation, combustion, etc. Moreover, this invention relates to the electrical wire which covered the periphery of a conductor with this covering material.
[0002]
[A Prior art and Object of the Invention] Various properties, such as mechanical properties, such as a **** property and abrasion resistance, C and ****, fire retardancy, thermal resistance, and cold resistance, are required of covering material, such as the electrical wire and optical fiber core wire which are used for an internal wiring of electronic equipment or an automobile, and an optical fiber code. For this reason, using the constituent which makes a principal component mixture of the ethylene system copolymer (the ethylene and the vinyl acetate copolymer, ethylene and an ethyl-acrylate copolymer) and this copolymer which blended the polyvinyl chloride compound or the halogen system flame retarder, and polyethylene as covering material, such as such electrical wire, optical fiber core wire, and a code, is known well. Furthermore, since it argues about the problem the plasticizer and heavy-metal stabilizer which are blended elute, or generate a lot of smoke and corrosive gases when these are discarded in recent years, without carrying out suitable processing, the study of the non halogen flame-resisting covering material which high-filled up the ethylene system copolymer with the metal hydrate is also performed instead of the constituent which used the polyvinyl chloride compound and the halogen system flame retarder. Ethylene when [required] high-filled up with a metal hydrate and the vinyl acetate copolymer, ethylene, an ethyl-acrylate copolymer, etc. are used for these non halogen flame-resisting covering material in many cases as a base polymer.
[0003] However, the tensile strength of these non halogen flame-resisting covering material was 10MPas, the melting point was about 100 degrees C, and it was not what satisfies the property demanded as compared with the property (tensile strength 15-20MPa, about 10% of 120 degree-C heating reduction of areas) of the polyvinyl chloride compound mainly used as covering material now. When it used these as covering material, such as electrical wire, optical fiber core wire, and a code, although the example of the constituent which made the base polymer the polypropylene regin which is excellent in a mechanical strength or thermal resistance, and electrical wire was indicated by the Provisional-Publication-No. 131052 [62 to] official report, and the publication-number 76645 [six to] official report in order to solve such a technical probrem, the C and ****, and cold resistance were problems. In an internal wiring of electronic equipment or an automobile, although the flexibility under -30--40 degree C low temperature was demanded, when the electrical wire which covered these polypropylene regins was twisted around the mandrel of the diameter of self under the -40-degree C low-temperature ambient atmosphere, there was a problem which generates a crack.
[0004] Moreover, when these were made into the covering material of an optical fiber code, there was a problem which makes the optical fiber core wire covered with operating wavelength in the low-temperature field 0 degree C or less generate a buckling, and generates the increase in transmission loss. this invention aims at a **** property required for covering material, such as electronic equipment, an internal wiring and optical fiber core wire of an automobile, and an optical fiber code, abrasion resistance, and offer of the covering material which has ****, fire retardancy, thermal resistance, and cold resistance as it is good, and has neither the elution of a heavy metal compound, nor occurrence of a lot of smoke and a corrosive gas at the time of abandonment of reclamation, combustion, etc.
[0005]
[The means for solving a technical problem] In order to attain the above-mentioned purpose, it sets to this invention. (1) As 20 % of the weight or more of polypropylene regins (a1), and a hard segment, polystyrene, As opposed to the resinous principle (A) 100 weight section containing 40 - 80 % of the weight (a2) of the styrene thermoplastic elastomers which have the hydride of a butadiene and/or an isoprene (**) polymer as a soft segment The covering material characterized by coming to carry out a polyphosphoric acid ammonium system flame retarder (B) 80-120 weight section combination of 30 - 70 weight section or the metal hydrate (C), (2) As 20 % of the weight or more of polypropylene regins (a1), and a hard segment, polystyrene, As opposed to 100 weight section of the resinous principle (A) containing 40 - 80 % of the weight (a2) of the styrene thermoplastic

elastomers which have the hydride of a butadiene and/or an isoprene (**) polymer as a soft segment The covering material characterized by coming to blend the mixture (D) 30 of a polyphosphoric acid ammonium system flame retarder and a metal hydrate, - 120 weight section, (3) (1) to which the aforementioned resinous principle (A) is characterized by containing an ethylene system copolymer (a3) in 30 or less % of the weight of the domain, or covering material given in (2) terms, And the electrical wire characterized by covering the periphery of a conductor with covering material (4), (1), (2), or given in (3) terms is offered.

[0006]

[Gestalt of implementation of invention] Hereafter, this invention is explained in detail. First, each component which constitutes the covering material of this invention is explained.

(a1) As a polypropylene regin used in a polypropylene regin this invention A polypropylene homopolymer, an ethylene propylene block copolymer, An ethylene propylene random copolymer, a propylene and 1-butene block copolymer, A propylene and 1-butene random copolymer, a propylene and 4-methyl pentene-1 block copolymer, It can use combining one sort of the resin chosen out of a propylene and 4-methyl pentene-1 random copolymer, a propylene and 1-hexene block copolymer, a propylene, 1-hexene random copolymer, etc., or two sorts or more. Among these, an ethylene propylene block copolymer and an ethylene propylene random copolymer are desirable. The melt flow rate (MFR) of an ethylene propylene block copolymer and an ethylene propylene random copolymer has the desirable thing of the domain for 0.5-15g / 10 minutes (load 2.16kgf, temperature of 230 degrees C).

[0007] (a2) The styrene thermoplastic elastomer used in a styrene thermoplastic elastomer this invention has polystyrene as a hard-segment, and has the hydride of a butadiene and/or an isoprene (**) polymer as a soft segment. This hydrogenates the letter copolymer of a block which consists of the block B which consists of the homopolymers or those copolymers of block segment A which consists of polystyrene, and a butadiene or an isoprene. As block A, polystyrene, a poly-o-methyl styrene, a poly-m-methyl styrene, a poly-p-methyl styrene, a poly-alpha methyl styrene, a poly-beta-methyl styrene, poly-dimethyl styrene, polytrimethyl styrene, etc. are mentioned, and a polybutadiene, a polyisoprene, a butadiene isoprene copolymer, etc. are mentioned as block B.

[0008] The styrene thermoplastic elastomer used for this invention is possible also for use of the A-B-B' type triblock copolymer using block B' to which the amount of vinyl combination of block B was reduced in order to raise a fluidity besides an A-B-A type triblock copolymer, and it can also combine two or more sorts of these. The hydride of these block copolymers has that desirable by which block A is hardly hydrogenated but block B and B' is hydrogenated alternatively. As such a thing, "KRATON" (a tradename, SHELL company make), "die ******" (a tradename, Japan Synthetic Rubber Co., Ltd. make), etc. are marketed.

[0009] In order to give fire retardancy, a polyphosphoric acid ammonium system flame retarder and/or a metal hydrate are blended with the covering material of this invention.

It sets to a polyphosphoric acid ammonium system flame-retarder this invention, and is tris as a polyphosphoric acid ammonium system flame retarder (the Lynn system flame retarder). -(2-hydroxyethyl)- The polyphosphoric acid ammonium containing nitrogen inclusion compounds, such as isocyanurate, a melamine, and a polyphosphoric acid amide, is used. As such a thing, "Hostaflam AP745" (a tradename, product made from HOECHST), "Sumisafe PM" (a tradename, Sumitomo Chemical Co., Ltd. make), etc. are marketed.

[0010] As a metal hydrate and a metal hydrate, it can use combining one sort of the inorganic compound which has a hydroxyl group or water of crystallization, such as an aluminum hydroxide, a magnesium hydroxide, a hydration aluminum silicate, a hydration magnesium silicate, a basic magnesium carbonate, and a hydrotalcite, or two sorts or more. Among these, a magnesium hydroxide is desirable and what performed especially surface treatment is desirable. As such a thing, commercial elegance, such as "****** 5, 5A, 5B, 5E, and 5J" (a tradename, consonance chemistry company make), can be used.

[0011] Moreover, in order to raise the flame-resisting effect of these polyphosphoric acid ammonium system flame retarder and a metal hydrate, it is also possible to blend quartz-glass fillers, such as silicone compounds, such as "SFR-100" (a tradename, product made from GENERAL ELECTRIC), and "a crystallite, fuse Rex" (a tradename, product made from **** Co.). In order to improve a fall of the mechanical characteristic in the case of using a metal hydrate, a quartz-glass filler, etc., you may use the denaturation polyolefine which denaturalized polyolefines, such as "N polymer" (a tradename, the Nippon Oil chemistry company make), with a unsaturated carboxylic acid or its derivative.

[0012] (a3) The covering material of an ethylene system copolymer this invention In the combination with a polyphosphoric acid ammonium system flame retarder and a metal hydrate Fuming is reduced or it aims at raising fire retardancy. Ethylene and a vinyl acetate copolymer (EVA), Ethylene and an ethyl-acrylate copolymer (EEA), ethylene and a methyl-acrylate copolymer (EMA), Ethylene system copolymers (a3), such as ethylene and a methyl-methacrylate copolymer (EMMA), ethylene and an acrylic-acid copolymer (EAA), and ethylene, a methacrylic-acid copolymer (EMAA), can be blended in less than 30% of the weight of the domain into a resinous principle. EVA and EEA are desirable among these ethylene system copolymers. MFR of an ethylene system copolymer has the desirable thing of the domain for 0.5-10g / 10 minutes (load 2.16kgf, temperature of 190 degrees C).

[0013] Next, each blending ratio of coal of the polypropylene regin (a1) in the covering material of this invention, a styrene thermoplastic elastomer (a2), an ethylene system copolymer (a3), a polyphosphoric acid ammonium system flame retarder, and a metal hydrate is explained. The rate of a polypropylene regin (a1) is 20% of the weight or more of the total amount of the resinous principle which consists of a resinous principle (A), i.e., a polypropylene regin, a styrene thermoplastic elastomer, an ethylene system copolymer, etc., and is desirable. [of 25 - 50 % of the weight] When this rate is 20 % of the weight or more, since mechanical characteristics, such as abrasion resistance and a **** property, and thermal resistance are good, it is suitable as covering material, such as an internal wiring and optical fiber core wire of electronic equipment or an automobile, and a code.

[0014] The rate of a styrene thermoplastic elastomer (a2) is 40 - 80 % of the weight in a resinous principle (A), and a desirable domain is 50 - 70 % of the weight. If the rate of the styrene thermoplastic elastomer in a resinous principle becomes less than 40 % of the weight, cold resistance will pose a problem like the conventional material. When a problem arises in the flexibility under -30--40 degree C low temperature when there were few these rates than 40 % of the weight and it considers as a wire-covering material, and it considers as the covering material of an optical fiber code, it becomes the cause of generating the increase in transmission loss in a low-temperature field 0 degree C or less with some operating wavelength. Conversely, since the fluidity of a material falls remarkably when this rate surpasses 80 % of the weight, a problem arises to fabricating-operation nature and it becomes difficult to carry out extrusion covering at a conductor, optical fiber core wire, a code, etc.

[0015] The rate of a polyphosphoric acid ammonium system flame retarder (B) is 30 - 70 weight section to the resinous principle (A) 100 weight section, and is 40 - 60 weight section preferably. If fewer than 30 weight section, fire retardancy sufficient as covering material, such as an internal wiring and optical fiber core wire of electronic equipment or an automobile, and an optical fiber code, will not be acquired. On the other hand, if 70 weight section is surpassed, since the smoke and gas which occur at the time of combustion increase, it is not desirable. The rate of a metal hydrate (C) is 80 - 120 weight section to the resinous principle (A) 100 weight section, and is 95 - 105 weight section preferably. If there are few loadings of a metal hydrate than 80 weight section, fire retardancy sufficient as covering material, such as electronic equipment, an internal wiring and optical fiber core wire of an automobile, and an optical fiber code, will not be acquired. On the other hand, if 120 weight section is surpassed, since mechanical characteristics, such as abrasion resistance and a **** property, will fall or a problem will arise in extrusion-molding workability, it is not desirable. The rate of the mixture (D) of a polyphosphoric acid ammonium system flame retarder and a metal hydrate is 30 - 120 weight section to the resinous principle (A) 100 weight section, and is 50 - 100 weight section preferably. If fewer than 30 weight section, fire retardancy sufficient as covering material, such as an internal wiring and optical fiber core wire of electronic equipment or an automobile, and an optical fiber code, will not be acquired. On the other hand, if 120 weight section is surpassed, since mechanical characteristics, such as abrasion resistance and a **** property, will fall or a problem will arise in extrusion-molding workability, it is not desirable.

[0016] It becomes possible to make fuming and the fire retardancy of covering material improve more of combination of an ethylene system copolymer (a3) by blending this. However, it is desirable still desirable that it is less than 30 % of the weight in a resinous principle (A), and the rate is 5 - 25 % of the weight. If it becomes 30% of the weight or more, a heat-resistant fall of covering material may start. Furthermore, in the covering material of this invention, in order to raise the fire retardancy, you may add carbon black, red phosphorus, etc. Moreover, you may add an antioxidant, an ultraviolet ray absorbent, a copper inhibitor, a dispersant, a pigment, etc. if needed.

[0017] The covering material of this invention can be obtained by carrying out melting mulling of each above-mentioned component. In order to carry out melting mulling of each component, use of well-known equipments, such as a biaxial mulling extruder, a pressurized kneader, a Banbury mixer, and a roll, is possible. Each component of a polypropylene regin, a styrene thermoplastic elastomer, an ethylene system copolymer, a polyphosphoric acid ammonium system flame retarder, and a metal hydrate may be mulled in what sequence, and after carrying out dryblend at a room temperature, you may carry out melting mulling of it. The electrical wire of this invention is obtained by covering the periphery of a conductor with the covering material of the aforementioned this invention. Extrusion covering of the covering material of this invention is carried out at the periphery, such as a conductor, and optical fiber core wire, an optical fiber code, using general-purpose extrusion covering equipment. It is desirable to make temperature of the extrusion covering equipment at this time into about 180 degrees C within a cylinder, and to make it into about about 180-200 degrees C in the crosshead section.

[0018] Although covered with the covering material of this invention, the example of structure is shown in drawing 1 -3. Drawing 1 is the cross section of one example of the electrical wire of this invention with which the covering material of this invention is prepared in the periphery of the conductor 1 which consists of solid wire or a stranded wire as an insulating layer 2. Drawing 2 is the cross section of other examples of the electrical wire of this invention with which an insulating layer 2 and the cutoff layer 3 are formed in the periphery of a conductor 1 at this order, and the covering material of this invention is prepared in the periphery as a protection layer (sheath) 4. Drawing 3 is the cross section of an example of the optical fiber code which formed the protection layer 6 which becomes the periphery of optical fiber core wire or the optical fiber code 5 from the covering material of this invention. Drawing 4 is the cross section of an example of the optical fiber code which formed the protection layer 6 which attaches the tensile-strength field 7 to the periphery of the optical fiber core wire 5, and becomes the periphery from the covering material of this invention in the optical fiber code of drawing 3 .

[0019]

[Example] Hereafter, an example and the example of a comparison explain this invention still in detail.

The covering material corresponding to each example and the example of a comparison was obtained by carrying out the dryblend of each component shown in one to examples 1-15 and example of comparison 11 tables 1-4 at a room temperature by each blending ratio of coal, and carrying out melting mulling using a pressurized kneader on the mulling temperature of 180 degrees C, and the conditions for mulling time 15 minutes. Next, extrusion covering of the obtained material was carried out by the thickness of 0.35mm at the periphery of the optical fiber core wire of 0.90mmphi which attached the tensile-strength field (Kevlar) the annealed-copper-wire top of 0.80mmphi (outer diameter) using general-purpose extrusion covering equipment, respectively, and electrical wire and the optical fiber code were obtained. About the **** property, tensile strength (MPa) by the tension test of the enveloping layer of each electrical wire and evaluation according [are extended and] to measurement of (%) were performed. The test condition was set to 25mm, 50mm of speed of testings, and min between the marked lines. Abrasion resistance measured

the minimum abrasion-resistance value (mm) of each electrical wire based on the wear tape method of an antifriction examination of automobile specification (JASO D 608-92). Weight was set to 450gves and the minimum abrasion-resistance value considered the thing 457mm or more as success (O).

[0020] It is [fire retardancy] JIS about each electrical wire. It evaluated according to C3005. **** time was made into 15 seconds and measured time until the flame of electrical wire after removing the flame of a burner disappears automatically. Fuming created the heat press sheet of each covering material, and evaluated it by NBS fuming examination. a ratio -- optical density made [125 or less thing] ** and 175 or more things x for O and the thing of 125-175 The increase in a loss at the time of a heating deformation examination of insulated wire, the examination with a low-temperature volume, and the thermo-cycle examination after optical fiber core-wire covering estimated thermal resistance and cold resistance. About a heating deformation examination of insulated wire, it is JIS. It evaluated according to C3005. The test temperature was set it as 120 degrees C, the load was set to 306gves, and the thing of 30% or less of reduction of areas was considered as success (O). After the examination with a low-temperature volume left insulated wire in the -40-degree C cryostat for 1 hour, it twisted around the mandrel of the diameter of self in the cryostat, and investigated the existence of the crack in an insulator. The case of O and crack **** was made into x for the case where he has no crack. As for the thermo-cycle examination, transmission loss with a measurement wavelength [in / in the increase with a measurement wavelength / in a four-cycle deed and a 0-80-degree C elevated-temperature field / of 1.55 micrometers in transmission loss / a heat-resistant O and a -20-0-degree C low-temperature field for a thing 0.05dB //km / or less] of 1.55 micrometers made the thing 2.0dB [/km] or less cold-resistant O at the temperature of -20-80 degrees C.

[0021] About extrusion-molding workability, the extrusion covering equipment of 35mm of the diameters of a cylinder was used, it was 200 degrees C in 180 degrees C of cylinder temperatures, and crosshead temperature, and when extrusion covering was carried out on the annealed copper wire of 0.80mm of the diameters of a conductor, the extrusion covering speed from which the insulated wire with a good appearance is obtained made the thing of the following x for the above thing by O and 50m/by 50m/.

[0022] In addition, each component shown in Tables 1-4 used the following.

(01) Ube Industries, Ltd. make Ethylene propylene random-copolymer;MFR5g / 10 minutes (230 degrees C, 2.16kgf) Tradename RF338A(02) Ube Industries, Ltd. make Ethylene propylene block-copolymer;MFR3g / 10 minutes (230 degrees C, 2.16kgf)

Tradename J903HK(03) SHELL company make Styrene thermoplastic elastomer;MFR10g / 10 minutes (200 degrees C, 5kgf) Tradename Clayton G1652 (04) Japan Synthetic Rubber Co., Ltd. make Styrene thermoplastic elastomer;MFR3.5g / 10 minutes (230 degrees C, 2.16kgf)

Tradename Die ****** 1320P(05) Mitsui DU-PONT-DE-NEMOURS poly chemical company make Ethylene and vinyl acetate copolymer;MFR1.0g / 10 minutes (190 degrees C, 2.16kgf)

Vinyl acetate content 28wt% tradename Eve FREX EV-270[0023] (06) The Mitsui DU-PONT-DE-NEMOURS poly chemical company make Ethylene and ethyl-acrylate copolymer;MFR0.5g / 10 minutes (190 degrees C, 2.16kgf)

Vinyl acetate content 15wt% tradename Eve FREX A-710 (07) Nippon Oil chemistry company make Denaturation polyolefine;MFR1.0g / 10 minutes (190 degrees C, 2.16kgf)

tradename N polymer L6100M(08) Japan Synthetic Rubber Co., Ltd. make ethylene-propylene rubber; tradename EP01P(09) Riken Vinyl Industry Co., Ltd. make Polyvinyl chloride compound; tradename IG-5071 (10) Sumitomo Chemical Co., Ltd. make Polyphosphoric acid ammonium system flame-retarder A; tradename Product made from Sumisafe PM(11) HOECHST polyphosphoric acid ammonium system flame-retarder B; tradename Hostaflam AP745 (12) consonance chemical-industry company make magnesium-hydroxide; tradename ****** 5A(13) GENERAL Product made from ELECTRIC silicone; tradename SFR- pen ********** chill-tetrakis made from 100 (14) CIBA-GEIGY [-- 3 - (3, 5-G t-butyl-4-hydroxyphenyl) propionate; tradename IRGANOX1010 [0024]

[Table 1]

表1

実施例			1	2	3	4	5	6	7
配合量部	R-PP	(01)	55	25	40	40	40	40	
	B-PP	(02)							40
	SEBS	(03)							
	HSBR	(04)	45	75	60	60	60	60	60
	EVA	(05)							
	EEA	(06)							
	MAH-G-PE	(07)							
	EPR	(08)							
	PVC	(09)							
	ポリオルガノシロキサン系難燃剤A	(10)	50	50	35	65			50
	ポリオルガノシロキサン系難燃剤B	(11)							
	水酸化マグネシウム	(12)					90	110	
	シリコーン	(13)							
	酸化防止剤	(14)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
特性	引張特性								
	引張強度 (MPa)		20	15	18	16	14	12	20
	伸び (%)		800	1000≦	850	800	600	500	700
	耐摩耗性		○	○	○	○	○	○	○
	難燃性		4～12	16～24	15～21	8～12	18～24	10～18	10～14
	発煙性		△	○	○	△	○	○	△
	耐熱性								
	絶縁電線		○	○	○	○	○	○	○
	光ファイバ心線		○	○	○	○	○	○	○
	耐寒性								
	絶縁電線		○	○	○	○	○	○	○
	光ファイバ心線		○	○	○	○	○	○	○
	押出成形加工性		○	○	○	○	○	○	○

[0025]
[Table 2]
表2

実施例			8	9	10	11	12	13	14	15
配合量部	B-PP	(01)	40	40	40	25	25	40	35	40
	B-PP	(02)								
	SEBS	(03)	60	30						
	HSBR	(04)		30	60	50	50	60	60	60
	EVA	(05)				25				
	EEA	(06)					25			
	MAH-G-PE	(07)							5	
	EPR	(08)								
	PVC	(09)								
	ポリオルガノシロキサン系難燃剤A	(10)	50	50		50	50	45		50
	ポリオルガノシロキサン系難燃剤B	(11)			50				100	50
	水酸化マグネシウム	(12)								
	シリコーン	(13)						5		
	酸化防止剤	(14)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
特性	引張特性									
	引張強度 (MPa)		27	25	16	15	15	20	15	15
	伸び (%)		550	650	800	700	700	750	550	600
	耐摩耗性		○	○	○	○	○	○	○	○
	難燃性		12～16	10～14	2～4	2～6	2～4	3～6	12～20	12～22
	発煙性		△	△	○	○	○	○	○	○
	耐熱性									
	絶縁電線		○	○	○	○	○	○	○	○
	光ファイバ心線		○	○	○	○	○	○	○	○
	耐寒性									
	絶縁電線		○	○	○	○	○	○	○	○
	光ファイバ心線		○	○	○	○	○	○	○	○
	押出成形加工性		○	○	○	○	○	○	○	○

[0026]

[Table 3]
表3

比較例		1	2	3	4	5	6	7
配合量部	R-PP (01)		100		65	15	40	40
	B-PP (02)							
	SEBS (03)							
	HSBR (04)				35	85		60
	EVA (05)			95				
	EEA (06)							
	MAH-G-PE (07)			5				
	EPR (08)						60	
	PVC (09)	100						
	酸変性ポリオレフィン系熱可塑性エラストマーA (10)				50	50	50	25
	酸変性ポリオレフィン系熱可塑性エラストマーB (11)							
	水酸化マグネシウム (12)		100	100				
	シリコーン (13)							
	酸化防止剤 (14)		0.5	0.5	0.5	0.5	0.5	0.5
特性	引張特性							
	引張強度 (MPa)	18	22	10	24	9	10	18
	伸び (%)	300	650	400	650	1000≧	500	800
	耐摩耗性	○	○	×	○	○	○	○
	難燃性	1～3	14～24	10～16	4～8	20～30	12～18	25～40
	発煙性	×	○	○	△	○	△	○
	耐熱性							
	絶縁電線	○	○	×	○	○	×	○
	光ファイバ心線	○	○	○	○	○	○	○
	耐寒性							
	絶縁電線	○	×	○	○	○	×	○
	光ファイバ心線	○	×	○	×	○	○	○
	押出成形加工性	○	○	○	○	×	○	○

[0027]
[Table 4]

表4

比較例			8	9	10	11
配合量部	R-PP	(01)	40	40	40	15
	B-PP	(02)				
	SEBS	(03)				
	HSBR	(04)	60	60	60	50
	EVA	(05)				35
	EEA	(06)				
	MAH-G-PE	(07)				
	EPR	(08)				
	PVC	(09)				
	ポリオレフィン系難燃剤A	(10)	75			
	ポリオレフィン系難燃剤B	(11)				
	水酸化マグネシウム	(12)		70	130	
	シリコーン	(13)				
	酸化防止剤	(14)	0.5	0.5	0.5	0.5
特性	引張特性					
	引張強度 (MPa)		15	18	8	10
	伸び (%)		750	650	250	500
	耐摩耗性		○	○	×	○
	難燃性		5～9	28～40	10～14	1～4
	発煙性		×	○	○	○
	耐熱性					
	絶縁電線		○	○	○	×
	光ファイバ心線		○	○	○	○
	耐寒性					
	絶縁電線		○	○	○	○
	光ファイバ心線		○	○	○	○
	押出成形加工性		○	○	○	○

[0028] The result of Tables 1-4 shows the following things. Although the example 1 of a comparison is an example which used the polyvinyl chloride compound as covering material and it is the material excellent in various properties, there is a problem generate a lot of smoke and corrosive gases at the time of the combustion. It is the purpose that this invention offers the alternate material of this polyvinyl chloride compound. The example 2 of a comparison is an example which used only the ethylene propylene random copolymer as a base polymer. Although this thing is the non halogen fire retarding material excellent in the mechanical strength, when it considers as a wire-covering material, when [in low temperature] a problem is that it is good in **** and it considers as the covering material of optical fiber core wire, there is a problem that transmission loss increases remarkably, in a low-temperature field. It is the example for which the example 3 of a comparison used ethylene and the vinyl acetate copolymer as a base polymer, and used the magnesium hydroxide as a flame retarder. Although the denaturation polyolefine is blended for the purpose of raising the compatibility of a base polymer and a metal hydrate, there is a problem that mechanical characteristics, such as a **** property and abrasion resistance, are low. Moreover, depending on a base polymer, thermal resistance is low.

[0029] The examples 4 and 5 of a comparison make the loadings of a styrene thermoplastic elastomer out of range [this invention]. Although tensile strength improves from contrast of the example 4 of a comparison, and the example 1 when the loadings of a styrene thermoplastic elastomer are made into less than 40% of the weight of a resinous principle, it turns out that the increase in the transmission loss in a low-temperature field is not improved. Moreover, it turns out that a fall of **** luminous intensity and a fall of extrusion-molding workability pose a problem from contrast of the example 5 of a comparison, and the example 2 on the other hand although the increase in transmission loss [field / low-temperature] when the loadings of a styrene thermoplastic elastomer surpass 80 % of the weight is improved.

[0030] The example 6 of a comparison is an example which did not blend a styrene thermoplastic elastomer but blended ethylene-propylene rubber. A problem is in the thermal resistance and cold resistance in a fall and insulated wire of tensile strength so that it may understand by the contrast with examples 3 and 4 etc.

[0031] The examples 7 and 8 of a comparison make the loadings of a polyphosphoric acid ammonium system flame retarder out of range [this invention]. Since self-****** in a combustion test was extended when the loadings of a polyphosphoric acid ammonium system flame retarder were made under into 30 weight section to the resinous principle 100 weight section so that it might understand by the comparison with examples 3 and 4, when a problem arises in fire retardancy and 70 weight section is surpassed, fuming poses a problem and it does not change at all with the polyvinyl chloride compound of the example 1 of a comparison which has a problem about this point.

[0032] The examples 9 and 10 of a comparison are examples at the time of using a metal hydrate in the amount of this invention

out of range as a flame retarder. The contrast with examples 5 and 6 shows that a problem arises in fire retardancy to the resinous principle 100 weight section when the loadings of a metal hydrate are under 80 weight section, and the problem to which mechanical characteristics, such as a **** property and abrasion resistance, fall arises in surpassing 120 weight section. The example 11 of a comparison is an example which had loadings [good] for the ethylene system copolymer for 30 % of the weight in a resinous principle. While fire retardancy will improve when the loadings of an ethylene system copolymer increase if it contrasts with an example 11, it turns out that a **** property and thermal resistance fall.

[0033] An example 7 is an example which used the ethylene propylene block copolymer as a polypropylene regin. It turns out that a block copolymer can be used like a random copolymer. A block copolymer is desirable when thinking the thermal resistance of covering material as important. An example 8 is an example which used the A-B-A type thing as a styrene thermoplastic elastomer. Although extrusion-molding workability falls a little as compared with the A-B-B' type thing currently used in other examples, not the level that poses a problem as covering material but tensile strength improves. An example 9 can have the outstanding fabricating-operation nature which an A-B-A and A-B-B'high mechanical-characteristic [which is the example which used two of types and an A-B-A type has] and A-B-B' type has as a styrene thermoplastic elastomer.

[0034] Although an example 10 is an example which used the polyphosphoric acid ammonium system flame retarder from which the nitrogen inclusion compound contained is different, a property top problem is not seen. An example 13 is an example which used together the polyphosphoric acid ammonium system flame retarder and the silicone compound. Use of a silicone compound shows that the fire retardancy of the covering material of this invention improves. In the system which uses a metal hydrate as a flame retarder, an example 14 is an example which blended the denaturation polyolefine, and combination of a denaturation polyolefine is also possible for it for the purpose of raising the compatibility of a base polymer and a metal hydrate.

[0035]

[Effect of the invention] The covering material of this invention as a polypropylene regin (a1) and a hard segment Polystyrene, The resinous principle which comes to contain the styrene thermoplastic elastomer (a2) which has the hydride of a butadiene and/or an isoprene (**) polymer as a soft segment (A), And it comes to blend the mixture (D) of a polyphosphoric acid ammonium system flame-retarder (B) metal hydrate (C), or a polyphosphoric acid ammonium system flame retarder and a metal hydrate by specific proportion. The **** property demanded when used as covering material, such as an internal wiring and optical fiber core wire of electronic equipment or an automobile, and an optical fiber code There are abrasion resistance and the outstanding characteristic feature it not only has various properties, such as ****, fire retardancy, and cold resistance, as it is good, but that no occurrence of the elution of a heavy metal compound, a lot of smoke, and a corrosive gas is in discarding these covering material. the former since it has the outstanding thermal resistance especially as an insulating wire-covering material, and a peroxide -- bridge formation and an electron ray -- the use as an alternative of the covering material which was constructing the bridge is possible, and use in a wide range temperature field is more possible than PVC which is the conventional covering material as covering material, such as optical fiber core wire and a code, from having the outstanding thermal resistance and cold resistance Moreover, the electrical wire of this invention fulfills various properties, such as a **** property demanded as an internal wiring of electronic equipment or an automobile, abrasion resistance, C and ****, fire retardancy, and cold resistance, and does not have occurrence of the elution of a heavy metal compound, a lot of smoke, and a corrosive gas in the abandonment.

[Translation done.]